Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Unlicensed Use of the 6 GHz Band	)	ET Docket No. 18-295
	)	GN Docket No. 17-183
	)	

COMMENTS OF TARANA WIRELESS, INC.

I. INTRODUCTION

Tarana Wireless, Inc. ("Tarana", or "we") respectfully submits these comments in response to the Federal Communications Commission ("FCC")'s Notice of Proposed Rulemaking ("NPRM") released on December 17, 2018 in the above-captioned proceeding.[1]

Tarana has developed an American-made, 5G-like, broadband fixed-wireless platform to create a broadly scalable gigabit-speed wireless alternative to fiber, which is designed to operate in unlicensed spectrum. Such a unique system will free up precious and limited licensed bands for mobile users, while enabling low cost broadband deployment by a wider variety of internet service providers ("ISPs") and mobile operators. As part of this development, and in accordance with Title 47, Part 15 of the Code of Federal Regulations (the "Part 15 Rules"),[2] we are developing multi-antenna base nodes ("BN") and multi-antenna consumer premises equipment ("CPE") called residential nodes ("RN"). In doing so, Tarana has developed architectures and methods consistent with the Part 15 Rules in the U-NII-1 and U-NII-3 bands.[3] These architectures utilize multi-carrier, multi-user, and multi-stream transmitter design, cross-polarized antennas, multi-user multi-input and multi-output ("MIMO") and transmit and receive array processing algorithms. Tarana is guided by emissions testing recommendations described by the October 31, 2013

[1] *Unlicensed Use of the 6 GHz Band*, Notice of Proposed Rulemaking, FCC 18-147 (rel. December 17, 2018), https://www.federalregister.gov/documents/2018/12/17/2018-26013/unlicensed-use-of-the-6-ghz-band.

[2] 47 CFR § 15(e).
[3] Id.

FCC Office of Engineering and Technology ("FCC-OET") report titled "Emissions Testing of Transmitters with Multiple Outputs in the Same Band" (the "Oct. 2013 FCC-OET Report").[4]

These comments, which respond specifically to solicitations for comment in clauses 43-47 of the NPRM, are submitted to ensure that American-made systems, which have the potential to reduce the cost of broadband, are allowed the widest technology-neutral opportunity to innovate in the new "high power" unlicensed National Information Infrastructure ("U-NII") bands, specifically U-NII-5 and U-NII-7. In general, we believe that the effective EIRP should be increased to enhance cell coverage area, and that the FCC should consider each clause carefully to ensure it maintains a technology neutral structure, and does not accidentally limit new technologies.

We believe that the FCC should promote high spectral efficiency systems which make better use of precious spectrum recourses and extend the "footprint" of true broadband access into areas of the US that have zero or only one broadband provider.

II. COMMENTS AND RECOMMENDATIONS[5]

A. Clause 43 Recommendation

The maximum EIRP power spectral density limits contained in Clause 76 should be modified to read:

"U-NII-5 and U-NII-7 Standard-Power Access Points. The maximum conducted output power is 1 watt referenced to 20 MHz bandwidth and maximum power spectral density is 17 dBm in any 1 megahertz band. For a bandwidth greater than 20 MHz, the maximum conducted power limit is 30 dBm + 10log(B/20) where B is channel bandwidth in units of MHz. The maximum conducted power spectral density is 17 dBm in any 1 megahertz band.

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[4] "Emissions Testing of Transmitters with Multiple Outputs in the Same Band," Federal Communications Commission Office of Engineering and Technology, October 31, 2013, https://apps.fcc.gov/kdb/GetAttachment.html?id=B0ZQiTBTVsn3P3wZ2WdqhQ%3D%3D.

[5] To avoid confusion, please note that Tarana references clauses consistent with those contained in the Federal Register, as opposed to those contained in the October 2, 2018 FCC-CIRC1810-01.

If a transmitting antenna with directional gain greater than 6 dBi is used, the maximum power and power spectral density shall be reduced by the amount in dBi that the directional gain is greater than 6 dBi. The maximum power and power spectral density may be increased by 10log (360 / BWaz), where BWaz is the 3 dB beamwidth of the individual antenna elements in the azimuth plane."

B. Clause 44 Recommendation

Rules enabling the effective use of U-NII band 5 and U-NII band 7 for fixed broadband connectivity applications are critical in allowing wireless ISPs to deploy competitive broadband solutions. This will enable competitive deployment of wireless broadband networks in served as well as unserved and under-served communities. A proper rule structure in these bands will enable fixed broadband networks to increase competition in the home broadband connectivity sector in general, ultimately for the benefit of the consumers.

As illustrated by the large number of fixed wireless deployments in the U-NII-3 bands, the use of high-gain directional antennas has been a key factor in improving range, coverage area, quality and, ultimately, the cost of fixed wireless networks. Therefore, we believe that high-gain antennas should also be permitted for U-NII band 5 and band 7 in rules identical to U-NII band 3 for outdoor Point-to-Point ("PtP") systems, without a corresponding reduction in power or power spectral density. Note that automated frequency control ("AFC") protects primary users since the location, height, and EIRP of PtP radios are known.

C. Clause 44 Further Recommendation

Moreover, we also believe that point-to-multipoint systems can leverage high-gain directional beams, with each individual beam being adapted to point specifically to a single user, and to minimize interference in all other directions, in a manner equivalent to a PtP directional antenna beam, should also be allowed without a corresponding reduction in power or power spectral density. Such systems are completely new, having been developed after the classical definition of "point-to-multipoint" was created. As such, a more

proper term for these unique systems is "multiple-point-to-point" as they are literally multiple "point-to-point" radios operating from the same chassis.

D. Clause 45 Recommendation

The NPRM asks whether certain types of transmitters that employ electrically steerable, MIMO, or phased array antennas should have special rules which allow the device to operate with higher power levels. We believe the answer is yes.

Specifically, transmitters that employ multiple concurrent electronically steerable beams, thus improving spectral efficiency, should be subject to the conducted power level and power spectral density as stated above for each beam treated separately.

The conducted power at each antenna port to determine the maximum EIRP should use approved FCC-OET analysis methods. Two key aspects of the Oct. 2013 FCC-OET Report, which we support, are Section F.1 and Section F.2.c.i:

i. Section F.1 states that signals are "completely uncorrelated" for "Spatial Multiplexing MIMO (SM-MIMO), for which independent data streams are sent to each transmit antenna (e.g., WiMAX Matrix B). WiMAX Matrix C, which adds diversity, also produces uncorrelated transmit signals."

ii. Section F.2.c.i states: "In the case of a transmitter with only two outputs driving a pair of antennas that are cross-polarized (e.g., vertical and horizontal or left-circular and right-circular), directional gain is the gain of an individual antenna."

iii. Based on the above, F.2.e.ii states: "Directional gain = GANT MAX + 10 log(NANT/NSS) dBi, where NSS = the number of independent spatial streams of data and GANT MAX is the gain of the antenna having the highest gain (in dBi)."

E. Clause 46 Recommendation

While users should be permitted to choose an appropriate antenna for their application, any equipment authorization grantee should be required to (i) submit a list of permissible antennas to the FCC, and (ii)

maintain the list on its website. If the prospective grantee wishes to use its own antennas, then the antenna and its characteristics should be submitted with the prospective grantee's application.

F. Clause 47 Recommendation

The emission mask suggested by RKF Engineering should be modified to improve radio frequency co-existence where the access system density is high. Specifically, the emission mask should not exceed an EIRP of -27 dBm/MHz between the band edge and plus or minus 40 MHz from the band edge, and -37 dBm/MHz for offsets greater than 40 MHz.

III. CONCLUSION.

WHEREFORE, Tarana respectfully submits that the above technical comments will assist the FCC in promulgating technology-neutral spectrum regulation which (i) allows innovative technologies to flourish, and (ii) permits ISPs to bring competition into the many US markets that have been effectively monopolized by a single broadband provider.

Respectfully submitted,

/s/ Dale Branlund

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